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ABSTRACT

Among the three NTE Core Battery tests, Professional Knowledge purports to measure skills that are acquired only after academic experience as an education major, while Communication Skills and General Knowledge both purport to measure skills that do not require this specialized experience. The scores of education majors for the 1986-87 national test administrations were analyzed for differential sensitivity of the three tests to educational attainment. Results were used for 43,000 examinations at three administrations. Since examinees with different degrees of experience who choose to take the tests may have different levels of skills, test scores were adjusted for grade point average. Results showed that Professional Knowledge was more sensitive to academic experience than were General Knowledge or Communication Skills. This outcome is interpreted in support of the construct validity of the Core Battery. An appendix contains three summary data tables. (Contains two tables, three appendix tables, one figure, and two references.)
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GRADE LEVEL AND PERFORMANCE ON THE CORE BATTERY, 1986-87 NATIONAL ADMINISTRATION

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Educational Testing Service
Princeton, New Jersey
December 1988

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Grade Level and Performance on the Core Battery, 1986-87 National Administration

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October 24, 1988

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ABSTRACT

Among the three NTE Core Battery tests, Professional Knowledge purports to measure skills that are acquired only after academic experience as an education major, while Communication Skills and General Knowledge both purport to measure skills that do not require this specialized experience. The scores of education majors for the 1986-87 national test administrations were analyzed for differential sensitivity of the three tests to educational attainment. Since examinees with different degrees of experience who choose to take the tests may have different levels of skills, test scores were adjusted for grade point average. Results showed that Professional Knowledge was more sensitive to academic experience than were General Knowledge or Communication Skills. This outcome is interpreted as support of the construct validity of the Core Battery.

Grade Level[1] and Performance on the Core Battery, 1986-87 National Administrations

Overview

The three tests that comprise the NTE Core Battery may be distinguished by the degree of knowledge and skills they measure that is learned within or outside the teacher preparation program. The Test of Communication Skills is designed to measure skills that should be developed mostly before an individual takes any coursework in college. The Test of General Knowledge is designed to measure knowledge available to the well-educated teacher. Because it focuses on the areas of literature and fine arts, mathematics, science, and social studies, scores should not increase greatly in relation to exposure to teacher education. In practice, this means that they should not change substantially after the junior year, when specialized teacher preparation courses dominate the schedules of education majors. Finally, the Test of Professional Knowledge is designed to measure the knowledge and cognitive processes that the beginning teacher uses in making decisions. Examinees should be able to demonstrate these skills and knowledge only after exposure to teacher education, which generally begins in the junior year of college.

Based on the above logic, three hypotheses about performance of education majors on the Core Battery were investigated. The purpose of the investigation was to examine discriminant validity of the Core Battery tests in terms of their differential sensitivity to the skills and knowledge acquired at different times by education majors.

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[1] Grade level refers to year of undergraduate study.

Hypotheses

Given the different emphases of the three tests, the following are hypothesized about undergraduate test-takers:

1. There will not be significant score differences in Communication Skills related to years of education;
2. Changes in General Knowledge should not be specifically related to exposure to teacher education as opposed to exposure to general education. Consequently, changes in mean scores should not increase sharply after the junior year.
3. On the Test of Professional Knowledge, examinees who have had at least one year of professional training will outscore first-year students, sophomores and beginning-of-year juniors, who have not yet had professional training. Juniors who have had a year of professional training will also outscore first-year students and sophomores.

Methods

Several factors are related to what year of college examinees are in that could also affect test scores. For example, perhaps only the more skilled first-year students and sophomores take the Core Battery, especially in the large number of states that use Core Battery tests as one criterion for initial teacher certification.

Alternately, perhaps differences in scoring among examinees in different grade levels reflect attrition of poorly skilled education majors from the examinee group. For example, struggling students are more likely to be first-year students than to be seniors, both because they are more

likely to leave school and because they are less likely to be admitted to teacher education and therefore still be education majors after their sophomore year.

These and similar effects would result in a variation of Simpson's Paradox (Wainer, 1985); that is, for examinees with similar grade point averages, seniors may score significantly higher than first-year students or sophomores. However, when the scores of students are analyzed without considering grade point average, students with poor grades may not be as well represented in the senior or junior classes because they are more likely to have left school. This would affect the relationship between grade level and test scores. To control for these potentially confounding effects, self-reported cumulative grade-point average was statistically controlled in the analyses.

Obviously, grade-point average is not a very standard measure. It varies in relation to undergraduate major and the particular combination of courses taken, and from institution to institution. However, since grade-point average is an important predictor of remaining in college, it must be statistically controlled in any comparisons among students of different grade levels.

Sample

Table 1 shows the numbers of examinees who were part of the study. The sample included both first-time test-takers and repeat test-takers who identified themselves on the answer sheet as education majors. Other education majors may have been excluded from the sample because they could not be distinguished from non-education majors. For example, the answer sheet lists one major of practical arts and sciences, that includes

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Table 1

Numbers of Examinees by Test Date, Test, Grade-Point Average (GPA), and Educational Level

Test Date	Test	GPA	Educational Level: First-year, Sophomore	Junior	Senior	Graduate	Total
June, 86	Communication Skills	Below 2.50	76	115	115	91	397
		2.50-2.99	78	237	452	460	1,258
		3.00-3.49	70	231	472	785	1,217
		3.50-4.00	51	140	303	249	743
		Total	275	713	1,342	1,285	3,615
	General Knowledge	Below 2.50	80	112	129	105	426
		2.50-2.99	77	248	509	554	1,388
		3.00-3.49	70	236	527	709	1,542
		3.50-4.00	50	139	364	338	896
		Total	277	735	1,529	1,706	4,247
	Professional Knowledge	Below 2.50	9	33	93	98	233
		2.50-2.99	7	103	421	445	976
		3.00-3.49	12	91	463	483	1,049
		3.50-4.00	11	72	327	260	670
		Total	39	299	1,304	1,286	2,928

Table 1

Numbers of Examinees by Test Date, Test,
Grade-Point Average (GPA), and Educational Level

Test Date	Test	GPA	Educational Level				
			First-year, Sophomore	Junior	Senior	Graduate	Total
October 86	Communication Skills	Below 2.50	101	179	249	67	596
		2.50-2.99	154	327	989	292	1,762
		3.00-3.49	138	262	1,090	345	1,835
		3.50-4.00	69	150	509	177	905
		Total	462	918	2,837	881	5,098
	General Knowledge	Below 2.50	103	176	261	76	616
		2.50-2.99	154	345	1,051	351	1,901
		3.00-3.49	127	267	1,191	455	2,040
		3.50-4.00	61	149	572	234	1,016
		Total	445	937	3,075	1,116	5,573
	Professional Knowledge	Below 2.50	5	24	230	59	834
		2.50-2.99	10	94	1,098	266	1,468
		3.00-3.49	17	86	1,266	333	1,702
		3.50-4.00	15	55	679	176	925
		Total	47	259	3,273	834	4,413

Table 1

Numbers of Examinees by Test Date, Test,
Grade-Point Average (GPA), and Educational Level

Test Date	Test	GPA	Educational Level: First-year, Sophomore	Junior	Senior	Graduate	Total
March 87	Communication Skills	Below 2.50	146	174	224	59	603
		2.50-2.99	188	346	1,017	370	1,921
		3.00-3.49	187	376	1,051	453	2,067
		3.50-4.00	98	218	512	201	1,029
		Total	619	1,114	2,804	1,083	5,620
	General Knowledge	Below 2.50	141	181	222	65	609
		2.50-2.99	189	357	1,058	452	2,056
		3.00-3.49	175	395	1,193	630	2,393
		3.50-4.00	94	223	609	292	1,218
		Total	599	1,156	3,082	1,439	6,276
	Professional Knowledge	Below 2.50	7	47	232	62	348
		2.50-2.99	17	131	1,205	387	1,740
		3.00-3.49	19	154	1,395	467	2,035
		3.50-4.00	9	114	762	222	1,107
		Total	52	446	3,594	1,138	5,230

a category for industrial arts. Education majors may list their major as practical arts and sciences if they plan to be industrial arts teachers. However, prospective electricians may also be in this group.

Data Source

Data were taken from the June, 1986, October, 1986, and March, 1987 national administrations of the Core Battery. On the answer sheets, examinees were asked to rate their undergraduate grade-point average as 3.5-4.0, 3.0-3.49, 2.5-2.99, 2.0-2.49, 1.5-1.99 and below 1.5. For analysis purposes, these were regrouped as 3.5-4.0, 3.0-3.49, 2.5-2.99, and lower.[1]

Analyses

Analyses of covariance were computed for each test and each test administration. The test score was the dependent variable, grade level was the independent variable and self-reported grade-point average group was the covariate (Appendix A). The focus of the analyses was to determine if scoring differences were related to self-reported year of education. Since there were few sophomore and first-year students, these grade levels were collapsed. Therefore, comparisons were among four groups: first-year students and sophomores, juniors, seniors, and graduates.

Pre-planned comparisons (Helwig and Council, 1979) were employed to determine the significance of pairwise comparisons of the means attained by examinees grouped by educational attainment. In Table 2, significant

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[1] In most states using the tests, maintaining a minimum grade point average of 2.5 is a requirement of teacher education programs.

differences among these means are indicated through the use of roman numerals. Means that are associated with the same roman numeral are not significantly different while those that do not share the same roman numeral are significantly different.

Because this is a self-report, it is not always clear how examinees classify themselves in June. That is, some students who have just completed their sophomore year might call themselves "sophomores," while others with the same experience might call themselves "juniors." Since examinees are given no explicit instructions in this matter, the reader should keep this in mind when interpreting the outcomes of the June administration.

Results (Table 2 and Figure 1)

First hypothesis: Communication Skills: Juniors and seniors were not significantly different for any administration. Moreover, the group containing first-year students and sophomores was different from seniors only for the October administration. Even among these students, the mean score of 657.1 attained by first-year students and sophomores surpassed the highest cutoff scores currently used by any states for initial certification. Therefore, this difference may have little functional significance in terms of the probability of passing the test.

Second hypothesis: General Knowledge: First-year students and sophomores and juniors did not score significantly lower than seniors in either June 1986 or March 1987. In October, seniors ($\bar{x}$ = 655.9) did score significantly higher than juniors ($\bar{x}$ = 654.5).

Third hypothesis: Professional Knowledge: First-year students and sophomores, and juniors scored significantly lower than seniors or graduates

Table 2

Mean Converted Scale Scores Adjusted for Self-Reported Grade Point Averages on the June 86, October 86, and March 87 Administration of the NTE Core Battery for Education Majors, by Educational Level

		Communication Skills		General Knowledge		Professional Knowledge	
Test Date	Educational Attainment	Adjusted Mean	Grouping[1]	Adjusted Mean	Grouping	Adjusted Mean	Grouping
June 86	First, Soph.	656.9	I	653.8	I	650.5	I
	Junior	656.8	I	653.7	I	655.3	II
	Senior	657.5	I	654.4	I	658.2	III
	Graduate	658.7	II	656.0	II	659.7	IV
	Overall	657.7		654.9		658.5	
October 86	First, Soph.	657.1	I	653.7	I	650.6	I
	Junior	657.7	I, II	654.5	I	655.5	II
	Senior	658.2	II	655.9	II	658.4	III
	Graduate	659.0	III	657.1	III	659.5	IV
	Overall	658.1		655.7		658.4	
March 87	First, Soph.	659.3	I	654.4	I	654.4	I
	Junior	659.2	I	654.3	I	657.3	I
	Senior	659.1	I	654.6	I	658.5	II
	Graduate	660.5	II	655.7	II	660.0	III
	Overall	659.4		654.8		658.7	

[1]Means that do not share the same roman numeral of grouping are significantly different.

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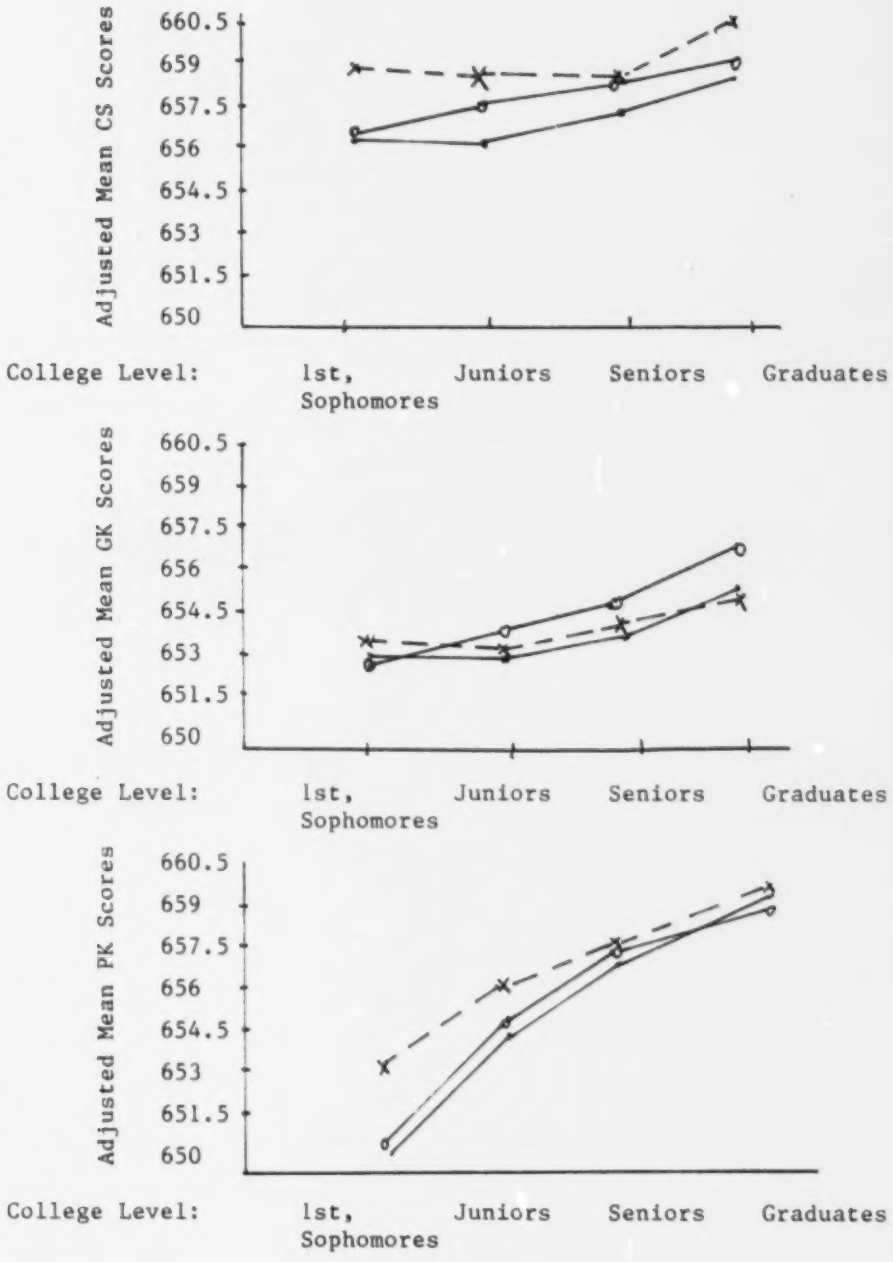
FIGURE 1

Adjusted Mean Communication Skills (CS), General Knowledge (GK), and Professional Knowledge (PK) Scores by Test Date and Grade Level



Discussion

We hypothesized that there would not be scoring differences attributed to grade level on the Test of Communication Skills. In fact, this was true for undergraduates in each analysis. The higher scores of college graduates probably reflects selection of better-skilled students to graduate school.

Since the Test of General Knowledge concerns skills that are not acquired in teacher preparation courses, scoring differences should not increase after junior year. In fact, this was found in all administrations except October, 1986. However, the mean difference between seniors and juniors was so small, and at such a high level of performance, it may have little practical significance.

Finally, in Professional Knowledge, seniors significantly outscored all other undergraduates in each administration. It is interesting that junior education majors also scored higher than first-year students and sophomores in June 1986 and October 1986. In March 1987, the differences were also large, but fell just short of statistical significance.

Conclusion

The hypotheses are generally consistent with the data. That is, Communication Skills, for the most part, does not seem to differentiate undergraduates. General Knowledge does not increase substantially after the junior year, while Professional Knowledge does. These results must be taken with some caution, since examinees take the tests for different reasons in different years of college. However, the results do give evidence of construct validity for the Core Battery and encourage continued research in this area, particularly longitudinal research.

A study of a cohort of students may be undertaken from their first-year through their senior year. In this way, such confounding sources of variance as reasons for taking the tests may be controlled.

References

Helwig, J. T. and F. A. Council (Eds.) (1979). SAS User's Guide, 1979 Edition. Cary, North Carolina: SAS Institute, Inc.

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Appendix A

ANCOVA Summary Tables for June 86, October 86 and March 87 Administrations of the Core Battery (Covariate = Grade Point Average, Predictor Variable = Grade Level)

Test Date	Test	Source	Sum of Squares	Degrees of Freedom	Mean Square	F-Ratio
June 86	Communication Skills	GPA	71368.79	1	71368.79	
		Grade Level	1975.16	3	658.39	5.42***
		Error	438255.83	3610	121.40	
		Total	516883.03	3614		
	General Knowledge	GPA	65060.68	1	65060.68	
		Grade Level	3699.02	3	1233.01	9.11***
		Error	573970.44	4242	135.22	
		Total	646533.53	4246		
	Professional Knowledge	GPA	69599.09	1	69599.09	
		Grade Level	7501.63	3	2533.88	22.10***
		Error	330761.33	2923	113.16	
		Total	408257.67	2927		

*Exceeds the $p < .05$ level of significance.

**Exceeds the $p < .01$ level of significance.

***Exceeds the $p < .001$ level of significance.

Appendix A

ANCOVA Summary Tables for June 86, October 86 and March 87 Administrations of the Core Battery (Covariate = Grade Point Average, Predictor Variable = Grade Level) (cont.)

Test Date	Test	Source	Sum of Squares	Degrees of Freedom	Mean Square	F-Ratio
October 86	Communication Skills	GPA	104917.61	1	104917.61	
		Grade Level	1345.01	3	448.34	4.17**
		Error	547610.55	5093	107.52	
		Total	658564.40	5097		
	General Knowledge	GPA	96404.65	1	96404.65	
		Grade Level	5020.97	3	1673.66	13.85***
		Error	672797.05	5568	120.83	
		Total	783330.64	5572		
	Professional Knowledge	GPA	119363.57	1	119363.57	
		Grade Level	5894.09	3	1964.70	18.55***
		Error	466849.08	4408	105.91	
		Total	592291.95	4412		

*Exceeds the $p < .05$ level of significance.

**Exceeds the $p < .01$ level of significance.

***Exceeds the $p < .001$ level of significance.

Appendix A

ANCOVA Summary Tables for June 86, October 86 and March 87 Administrations of the Core Battery (Covariate = Grade Point Average, Predictor Variable = Grade Level) (cont.)

Test Date	Test	Source	Sum of Squares	Degrees of Freedom	Mean Square	F-Ratio
March 87	Communication Skills	GPA	114320.06	1	114320.06	
		Grade Level	1742.16	3	880.32	5.36**
		Error	608492.98	5615	108.37	
		Total	727269.68	5619		
	General Knowledge	GPA	103293.74	1	103293.74	
		Grade Level	1751.20	3	583.73	4.73**
		Error	774362.73	6271	123.48	
		Total	883902.11	6275		
	Professional Knowledge	GPA	133464.03	1	133464.03	
		Grade Level	4103.01	3	1367.67	12.92***
		Error	563191.29	5225	105.87	
		Total	691203.22	5229		

*Exceeds the $p < .05$ level of significance.

**Exceeds the $p < .01$ level of significance.

***Exceeds the $p < .001$ level of significance.